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ABSTRACT

Because of the decline of farm population and family farms, the increase in energy-intensivity, and concentration process in agriculture, a rising tide of criticism has focused on the land grant system and its role in encouraging scientific applications supporting these trends. A study was conducted to develop a strategy that would change agricultural research priorities at the University of California and yet remain within the existing network of agricultural organizations, the United States Department of Agriculture, and the land grant complex of colleges. The strategy that emerged included a number of specific goals, including (1) reducing the energy consumption in agriculture, (2) halting the decline in the number of farms, (3) supporting self-production of food, (4) equalizing income within the agricultural producing sector, (5) reducing chemical applications in agriculture, (6) holding food quality constant or improving it, (7) holding food prices constant, and (8) limiting further concentration in agricultural production. Key elements of this strategy include prioritizing social and research goals, providing the appropriate agency with time to generate research to fulfill these goals, and attaching limited but distinctive penalties to the failure to develop research trajectories in keeping with the goals. This document also presents a procedure for assessing the research contribution through social impact assessment and examines the difficulties of developing change strategies. (Author/DS)

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Changing The Inequities of Agricultural Research Priorities

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Project on Social Impact Assessment and Values
University of California, Santa Cruz

1979

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Table of Contents

Introduction 1

Agriculture: The Rising Tide of Criticism 2

The University as a Focus of Change Strategies 5

Agricultural Science Values and Ethics 11

A Strategy to Change Agricultural Research Priorities 16

Social Impact Assessment as an Implementing Procedure 23

Impact Assessment: Social and Environmental 25

The Dangers and Problems of Change Strategies 28

Structural Problems of a Legislative Strategy 35

Conclusion 37

Bibliography 38

Abstract

Because of the decline of farm population and family farms, increasing energy-intensivity, and concentration process in agriculture, a rising tide of criticism has focused on the land-grant system and its role in encouraging scientific applications supporting these trends.

A strategy to change agricultural research priorities is proposed focused on the prioritization of social goals by the legislature. These goals include the reduction of energy consumption in agriculture, halting the decline in the numbers of farms, supporting self-production of food, equalizing income within the agricultural production sector, reducing chemical applications in agriculture, holding food quality constant or improving it, holding food prices constant, and limiting further concentration in agricultural production. One means, directly under the control of the University itself, is presented as a social goal: broadening the advisory apparatus of the University of California's agricultural division to include new constituencies. Although focused on California, the proposed strategy is viewed as having applicability in other circumstances.

Implementation of the goals would be effected through a base-declining budget for agricultural research in which failure to redirect research priorities would result in transfer of budget to agencies other than the University capable of supporting the goals.

A procedure for assessing the research contribution to the goals through social impact assessment is developed. The difficulties of developing the change strategy are also examined.

Introduction

> ...the supply and demand...for technical innovations in agriculture is centered around the payoff matrix and is conditioned by the socio-economic structure on the one hand, and the politico-bureaucratic structure on the other. Each economic or social group will put pressure on the politico-bureaucratic structure for research output...to be (or not to be) generated, depending upon their particular expected payoffs. The relative power of different economic and social groups over the politico-bureaucratic structure is the primary determinant in getting their specific demands eventually transferred into a supply of new knowledge or new technology. In the case of technology, pressure on the politico-bureaucratic structure results in a specific allocation of funds and human capital to research institutions, and within these, to particular lines of research (Ruttan 1978, p. 9).

This study sets out to conduct an analysis of existing structural arrangements that support publicly-funded agricultural research with the intention of developing a strategy oriented toward change. Although recognizing that such a strategic impulse might focus on creating a parallel set of institutions *outside* the existing network of agricultural organizations, the United States Department of Agriculture (USDA) and the land-grant complex of colleges, the basic approach that has been taken remains *within* the system. The demonstrated capacity of this institutional network to produce knowledge through its commitments to scientific research is well known. The essential problem becomes therefore, how to take an effective knowledge production system and redirect some of its energies to new orientations concerned with sustaining small farming, reducing energy intensivity, improving food quality, producing a more equal income distribution within agriculture, and reducing the enviromental effects of agricultural production.

Agriculture: The Rising Tide of Criticism[1]

Historically, concern for agricultural production has preoccupied the political system of the United States. The generation of the massive land-grant complex, the colleges of agriculture, the experiment stations, and agricultural extension, began with the Morrill Act in 1862 and has been the subject of continual attention not only by Congress and the federal system but also by many state governments.

More recently, the adoption in 1972 of the Rural Development Act and the Food and Agriculture Act in 1977 have responded to the continued concern about the status of the family farm and the decline of the rural sector. Though this concern has produced legislation addressing the problem, the hearings before Congressional committees, the many conferences that are held on the subject of rural depopulation and rural poverty, and the process of concentration in agriculture, attest to the need for a comprehensive response to the problems of the rural sector.

While reactions at the state level have been less consistent, a few states have shown considerable concern for the drop in the number of production units and the increase in size of remaining farms. Particular attention has been focused on the vertical integration of corporate entities into agricultural production and the purchase of farm land by foreign interests which have removed the control of agricultural lands from traditional hands. This process has aroused the ire of several state legislatures which have taken action in an attempt to halt this trend.

In California the budget for agricultural research has recently come under close scrutiny. Questions that would have been inconceivable a decade ago are now being asked by State Legislators. While many segments of the agricultural network contend that critical commentary emerges only from ignorant people and malcontents, the wide-ranging critique and the broad social base from which it emerges has created concern in a variety of political and administrative agencies.

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[1]Many critiques are available on existing arrangements with respect to agricultural research. A major and sustained criticism, by now a classic, will be found in Hightower (1973). For a brief scholarly summation of the criticism see Nicholson (1977).

Criticism of the orientation of agricultural institutions, however, has not been limited to governmental bodies. After 1973, a new criticism began to be manifested as the United States experienced, for the first time in its history, a major crisis over fuel resources. Having become the largest petro-chemical user in the world, the experience of having been cut off from external production sources gave rise to a fundamental questioning of energy usage. Agriculture, with its heavy commitment to capital-intensivity, became recognized as one of the country's major consumers of petroleum. Although spokespersons for agriculture pointed out that it is a major source of earnings through exports, the basic critique has continued. Taking the form of an appropriate technology movement, many doubts have been expressed about the orientations within the agricultural community that emphasize capital and energy intensivity.

The rising tide of criticism has been generated both inside and outside of agriculture itself. While some agricultural organizations have manifested their dissatisfaction with existing arrangements through formal processes, social movement types of organizations such as the American Agricultural Movement have also found it necessary to take action beyond existing formal organization.

Outside of agriculture, critical voices have been raised, although often in less systematic ways. A major source of criticism was generated with the inception of the environmental-ecological movement. Beginning with Rachel Carson's alarm at the indiscriminate use of DDT, environmentalists have become increasingly concerned about specific agricultural chemicals such as DES and DBCP as well as about the staggering variety of chemical fertilizers, pesticides, and other control chemicals now being applied almost universally in agricultural production. In the decade of the 1960s, the criticism of existing arrangements in agriculture became conjoined to some of the protest movements and resulted in a resuscitation of experiments around small-scale farming, organic farming, and non-chemical or limited-chemical production.

A more organized critical voice became evident as the unionization of farm workers began in the 1960s. Focusing on employment relations, an explicit critique of chemical applications which affected farm workers directly and a more implicit dissatisfaction with income distribution within large-scale production agriculture became voiced. Increasingly this critique, as formulated by the United Farm Workers Union,

has become concentrated not simply on agricultural employers but on the network of institutions that have developed and sustain existing employment relationships.

The response to much of the criticism, when there has been a response, has tended to concentrate on traditional strengths of the agricultural institutions. Almost invariably, the argument is presented that the United States, in contrast to most other countries, has a broader range of foods available for its citizens and at cheaper prices. The "efficiency" of American agriculture, which produces food and fibre with less than 5% of the labor force involved, is continually cited. And, in recent years, as the U.S. has become a major grain exporter, the contribution of agriculture to export earnings has been emphasized.

Though there can be little doubt about the productivity of American agriculture, there also can be little doubt about the legitimacy of much of the critical commentary. While less than 5% of the economically active population is involved in agricultural production, the undermining of the family farm and the denudation of an agriculturally-based rural population is also a fact of life. For those still believing in the jeffersonian ideal of an independent yeomanry as an important base for political democracy, the specter of economic concentration is surely worrisome.

The classic dilemma therefore becomes: how to control the present system in a way which arrests its tendencies toward concentration, increased size of production units, chemical-, capital-, and energy-intensivity? How can the erosion of family farms be halted? Even if the process cannot be reversed, can the existence of the present number of family farms be sustained? Is it possible to develop a different organization within agriculture which provides a higher quality of food with perhaps only small increases in costs? Can technologies appropriate to small-scale production be developed so that a variety of forms of agricultural production will be encouraged? Can employment within agriculture be stabilized and also increased?

Traditionally, these problems have been worried about more at the federal than the state levels and have given rise to a complex of legislation intended to develop and strengthen rural agricultural economies. Paradoxically perhaps, the very legislation and the institutions which have developed as a result have become the superintendents of the outcomes about which so much criticism has been

formulated. Each new piece of legislation has resulted from dissatisfaction with existing arrangements, yet each has eventually become an additional instrumentality contributing to what seems like an irreversable tendency in institutional development in the United States. The disappointments, for example, with the Rural Development Act of 1972 are already notable. And while the Food and Agriculture Act of 1977 raises additional hopes of sustaining the family farm, its failure to formulate a fundamental reorientation to the network of agricultural institutions gives rise to a suspicion that it too will prove to be disappointing and that the master trends towards agricultural concentration and rural denudation will continue.

In this study we will propose a strategy geared at working within the existing network of institutions, focused particularly on California. Since agriculture is not only of vital importance in the State, but also because the knowledge-production system in California is so powerful and efficient, we will suggest a strategy geared at the prioritization of social goals that ties the University's publicly-funded research budget to the attainment of these goals.

While the strategy and the discussion are focused very much on California, the analysis is based on broader national policies and actions. The basic strategy for California can, with some minor revisions, be applied to other conditions and circumstances.

The University as a Focus of Change Strategies

Every year California's State Legislature provides a major subsidy to California agriculture by the provision of a research budget for the University of California. This budget, approximating $30-35 million, is explicitly set aside for agricultural research. The State, while perhaps interested in research abstractly, does not provide funds for general academic research. For example, the extent to which research on rhyming patterns in Schiller's poetry receives funding within the University is the concern of the Regents and the faculty as a collective entity but not of the Legislature.

The State, as embodied in the Legislature and Governor, is concerned with research in *agriculture* since this endeavor is not only significant to the State's economy but also because the dispersed and diffuse character of agricultural production precludes the conduct of research by agricultural producers themselves. This, at least, has been the historical argument for the use of public funds for research which benefits the private interests of the individual farmer.[2]

Not only does the Legislature provide direct allocations through the budgetary process, the State and Federal governments provide institutional possibilities for self-regulation for research purposes through marketing orders. While marketing orders can be used for other purposes such as production control or encouraging consumption, the marketing order procedure creates the necessary institutional support for research within specific agricultural sectors. And although producers are likely to consider the funds generated through marketing orders as "their" contribution rather than a public one, the fact that the public, through government, makes such procedures feasible and supervises their organization indicates that these funds, too, constitute public support for agricultural research.

Thus, three major sources of funding exist which are important to the University's budget for agricultural research. Most important is the Legislature's allocation to the University directly, with few, if any, qualifications. Marketing orders regulated by the State are the second source of funds. Although mandated that the University shall have first option to conduct research generated by marketing orders, not all such research may be conducted by the University. The University nevertheless serves as the major recipient of funds for such specially-designated research. The University also receives private bequests, grants, and contracts for a variety of research activities, some specifically delineated (in contracts) and others only generally set out. Of the three sources, the Legislature makes the most sizable contribution to the University's budget. Marketing orders are the next most important generator of research funds. Control over the delineation of research projects rests, however, with the organized commodity group

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[2]Because of the increased concentration in agriculture and, particularly because of the large-scale corporatization of important production sectors, the basis for this argument has been significantly undermined in the past two decades.

through which the funds are collected. Private funding of research is even more circumscribed. It is, therefore, the Legislature that makes a major contribution to the research process by the provision of public funds and it is to this source of funding that we address a strategy of change.

Since the Legislature is one concrete instrumentality which can produce change, it is important to address more deliberately the issue of why the University and its agricultural research activities become the direct location within which we believe change can be effected.

The University, like land-grant institutions throughout the United States, is a knowledge-generating system. Its capacity to produce knowledge in the form of scientific discoveries relating to agriculture is well-known. But a major problem exists in the *type of knowledge* which gets generated in agricultural research. In general, researchers like to think of themselves as independent thinkers working on problems which are part of their discipline. Agricultural researchers are no exception to this norm. Yet our understanding of the way knowledge is produced, based on historical analysis of the outcomes of research, demonstrate that, while the individual researcher may view him or herself as autonomous, knowledge production is itself *not* an autonomous process. The process of knowledge production is enmeshed in the exercise of power within a network of dense social relationships.

Consider an obvious example: interest in atomic energy accelerated at the beginning of the second world war not because of scientific curiosity but because of applications that were found desirable. Similarly, but much more subtly, the social process influences the research problems of scholars. And when the scientific process is linked to the institutions of agriculture, it can be expected that there will be concrete influences that shape the research agendas of individual scholars. In California, we can note, for example, that the State Legislature responded to the end of the bracero program in 1964 by specially designating a budget for mechanization research. Other similar interventions have been notable but even these do not take account of the more informal processes that exist and shape the delineation of research problems.

Where the values bias of agricultural research can most clearly be seen is in the social outcomes of research. When the totality of research is considered and placed within its institutional setting, it

becomes clear that research has contributed to the master social trends in U.S. agriculture of *aggregation* and *concentration,* as well as the *undermining of family farms and the population base.* Similarly, it is clear that the key institutions of agriculture such as Agricultural Extension have been linked, from their inception, with larger rather than smaller farmers. It is also clear that larger farms can more easily capitalize on research findings than smaller ones. And it is also clear that research has been geared more heavily toward "efficiency" in terms of input-vs-output relationships than any other considerations. Thus, research within the land-grant complex has developed a values orientation aimed at large-scale enterprises, capital-intensivity, and concentration even though individuals involved may have deplored this trend (Nicholson 1977).

If individual researchers have viewed themselves as value neutral, their socialization and their institutional attachments have contributed not only to the support of this self-conception but also to the sustenance of research output geared at larger producers rather than smaller ones. In the professional training of many agricultural scientists, the continual capacity to specify *production accomplishments* is part of the justification for continued public support of research. State legislatures and the Congress are not interested in some abstract search for truth; in a variety of ways, through formal delineation of goals as well as informally, it has been made clear that it is production which has been wanted (Rosenberg 1976, Chaps. 8-11). Many agricultural scientists are, themselves, products of the system in which they are currently involved; they had their professional socialization as graduate students within the institutions of agricultural research and they have come to accept, as a norm of institutional affiliation, that they must produce this type of knowledge. Far from being autonomous, therefore, there is a primordial, normative understanding that research must produce results or else.

"Or else" operates at two levels. At the organizational level the officials of the land grant complex continually point to the contributions of research to output to justify continued budgetary support, recognizing that lack of satisfaction with research output, e.g., "production," will result in reduced budgets. This translates, at the level of the individual researcher, as a pressure to produce utilizable research but, following the tradition of the University as a whole, it takes the form of

"publish or perish" review in the personnel process.

Accelerating these tendencies are the institutional linkages that have developed in the agricultural knowledge production system. Agricultural scientists do not simply develop research agendas because they are curious about them. Scientific research costs money, and dollars must be found to sustain it. Control over resources is concentrated within the administrative organization of the University; it is the administrators and deans who control, to a considerable degree, the basic resource allocations. The peer review process is not unimportant but operates within the parameters determined through administrative action.

The process also operates with organizational entities such as Agricultural Extension. Because Extension personnel had to justify their own "productivity" historically, they became linked to the more efficient producers (McConnell 1969; Fiske 1977). These linkages, originally formalized, are still informally very effective: it is more probable that a larger grower will have his problems addressed by an extension agent than a smaller grower. Extension people, who serve as an important link to researchers, while themselves also conducting research, not only feed problems to researchers but serve as an important conduit for research results.

These institutional connections have produced the outcome that research results have been concentrated on the larger producers and have therefore facilitated the concentration process within agriculture. Larger growers have the economic capacity to "capture" new developments better than small producers because they have more leeway to experiment with new developments and can utilize the division of labor permitted by their larger scale, facilitating the absorption of knowledge more rapidly than smaller producers. Equally, they can articulate their needs better than smaller units and are reinforced by knowing that they carry more weight because of their economic importance. Thus, scientific knowledge is more available to large, capital-intensive producers than to other production groups in agriculture.

One way in which the research apparatus in agriculture manifests its bias has been with respect to agricultural labor. While concentration in agriculture has produced an increasingly differentiated stratification system of employers, managerial personnel, supervisors, and workers, very little attention has been dedicated in research to outcomes that will

benefit those at the base of the production process. Attention is continually given to costs of production, management, and to a smaller degree to human factors engineering, but little research has been conducted that benefits workers or encourages technologies appropriate to their needs. Despite the obvious utility in understanding simple facts such as the demography of agricultural workers, even this subject area has not been given much attention.[3] Other factors involving the analysis of production from the workers' point of view have been completely ignored. Social analysis of the consequences of changing forms of production on family life, on settlement patterns, and on the internal relationships within production organizations simply have not been undertaken (Friedland 1979). Although the ratio of workers to employers has increased, reflecting the stratification patterns of a concentrated system of production, little is known in any systematic way about employment relations in agriculture.

Agricultural research has developed within a network of interests that continue to formulate research agendas in ways that serve a limited, but extremely powerful, constituency: large-scale agriculture. The development of structures that will produce research directed at other constituencies, serving *their* interests, constitutes the thrust of the present analysis.

The explicit purpose of this study, therefore, is aimed at the restructuring, over the period of the next two decades, of research areas developed within the University's agricultural research organization to:

- reduce energy intensivity and encourage smaller-scale appropriate technology;
- arrest or reverse the trend toward reduction of the number of family farms;
- produce a more equitable distribution of income within agriculture and improve the conditions of agricultural workers;
- improve the quality of food to consumers without significantly increasing its cost;

[3]In California there have been two notable exceptions. See Peterson 1969 and Barton 1978.

- and finally, to reverse the direction of ecological and environmental deterioration by improving the quality of land, water and air.

The changed emphasis on this kind of research will serve interests, strata, and organizations other than those that have been traditionally supported by the University's agricultural research but will continue to fulfill the traditional mandates of the agricultural research structure.

Agricultural Science Values and Ethics

The issue of the ethical standards of agricultural scientists arises for two reasons.

First, the scientific community has become increasingly concerned since the second world war with the consequences of research. Until the development of the atom bomb, the preponderent view in the scientific community was fundamentally positivist in the orientation that science was a value-neutral activity. Except for the occasional scientist with a social conscience, the ethical elements involved in scientific research were not given serious consideration. This is not to say that there were no scientists concerned with these problems. Indeed, in the development of scientific medicine in Germany, a school of social activists, including Rudolf Virchow, was concerned with integrating "the reform of society and the reform of science and medicine" (Mendelsohn 1977, pp. 8-11). But these tendencies became submerged by the view of science as an autonomous activity, independent of the social system.[4] In its most exaggerated form, science is characterized as a purely individual activity reflective solely of the individual genius and totally independent of surrounding social organization.

The second world war and the monumental effects of the atomic bomb renewed the earlier social concerns of scientists. Since that time a serious debate has progressed, with many ebbs and flows, over the ethical, moral, values, and normative aspects of the scientific enterprise.

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[4]For a good summary of "internalist" (autonomous) views of science see Busch and Lacy 1979 who also present a summary of opposed "externalist" arguments about the sociology of science. See also Nicholson (1977) who explicitly compares agricultural research as "accountable" and biomedical research as "autonomous."

The second consideration stems from the special character of the agricultural sciences. Substantially insulated from the larger scientific community (Mayer and Mayer 1974), agricultural scientists have tended *not* to be involved in the debates that have surfaced elsewhere. This is, perhaps, because of the institutional development of the agricultural sciences. In this network, the kinds of debates that occur within the broader scientific community seem to have few ramifications. Agricultural scientists appear, therefore, not to have the institutional relationships that encourage such debates. Nuclear physicists may have relationships with developmental laboratories, but they are less linked in all aspects of professional socialization and interaction, to that limited community. The agricultural sciences are, thus, institutionally variant from most other scientific communities.[5]

This is not to argue that the agricultural scientific community is completely insulated from external trends; in many places substantial integration occurs between some segments of the agricultural scientific community and the external community of scientists.

In the biological sciences, however, the surfacing of major debates over ethical dilemmas occurs within the context of the larger scientific community, e.g., amongst biologists, rather than having significant ramifications within the context of the agricultural sciences network. Biologists are engaged in a continuing and fairly intensive debate about experimentation with recombinant DNA; this debate occurs within the biological community and in interaction with other scientists, some philosophers and others adjacent to the community, but it has no public ramifications within the agricultural sciences community of biologists. For those agricultural biologists who wish to participate in the debate, the venue is removed *outside* the agricultural sciences network. The agricultural sciences remain, therefore, as the Mayers characterized them in 1974, an "island empire."

Despite the insular quality of the agricultural scientific community, the growing criticism of the outcomes of one hundred years of scientific development bring value and ethical issues to the forefront of discussion. Padfield (1971), for example, has contended that modern

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[5]This view is not based on concrete empirical studies but on impressions developed by observing the two networks of scientists. Our familiarity with the agricultural science community is much greater than with the nuclear science network.

agriculture has been a major contributor to the urban crisis in America. Contending that national policy facilitated capital investment and accumulation, Padfield further argues that technological development accelerated the process of concentration which then had the concomitant effects of producing the shift from a largely agriculturally-based population to an industrial one. At the same time, Padfield demonstrates that capital concentration in the countryside produced population concentration in the city with its effects. The thrust of such criticism inevitably must raise questions concerning the cumulative effects of scientific and technological discoveries in agriculture on the social system.

Distinctive values questions can and should be broached within the agricultural sciences community, although they could just as well be surfaced within the broader scientific body; these have to do with the fact that much of the agricultural sciences enterprise is publicly-funded. If a segment of science is funded through the public sector, do the participants in this segment have distinctive normative and ethical responsibilities? And to whom? And in what way should those responsibilities be handled?

Interestingly, this question of the differential responsibilities of scientists whose work is publicly funded in contrast to those whose work is either privately or self-funded does not seem to have been an issue to which scientists have addressed themselves. Although many scientists in fact are funded, to one degree or another, through governmental bodies or through agencies such as public universities, the distinctive responsibilities that rest upon them as servants, in some sense, of the public interest have not been the subject of debate.

Where the agricultural scientists might have contributed to initiating such a debate, no such contribution has surfaced. This is, in all likelihood, because the commanding elements of the agricultural sciences community have delineated the research agendas in terms of specific output, e.g., "hard science" issues. The "softer" elements of the sciences, the social sciences for example, have been given miniscule support by comparison (Hathaway 1972). And still "softer" bodies of knowledge such as history have been only weakly sustained. As for that body of knowledge that specializes in values questions, philosophy, we know of no work that has been supported in any kind of systematic way within the agricultural sciences community.

The manner in which we have formulated our issue, however, raises the ethical question: do scientists who are institutionally linked to the public sector have distinctive responsibilities to fulfill the goals which have been expressed through legislative intents? Or can they legitimately ignore the *intents* and simply focus their attention on narrow implementation of the legislative language? Or simply fulfill the intents *interpreted* on their behalf by the administrative leadership of their organizations?

Perhaps unsurprisingly, we take the view that the agricultural sciences community has a distinctive moral obligation that it has long overlooked. This view perhaps will stand at odds with some of the main argumentation that has been formulated by even those scientists and moral philosophers who have been involved in the science-values debate.

Sinsheimer (1978) takes a strongly interventionist orientation urging that some scientific problems should be eliminated by scientists themselves, basing his argument on the notion that some research is *of dubious merit.* Dubious merit research includes, for Sinsheimer, research whose outcome, even if successful, has no applicability; research which consumes enormous resources without having any visible utility; or research whose consequences might upset the entire biological system e.g., research to halt or impede the aging process. For Sinsheimer, scientists, and implicitly also the broader community since all of us are involved, should exclude certain kinds of research from consideration; human curiosity, in other words, is not sufficient justification to sustain *any* research trajectory.

Bok (1978) raises still more complex issues. Contending that "What is needed is accountability not merely to colleagues, but to all who are at risk or their representatives" (p. 118), Bok delineates three strategies to deal with the consequences dilemma. First, she contends that all regulation should be removed from clearly innocuous research. Next, she argues that where abuse is "clear-cut" or "reckless," regulation and control are required and suggests some standards that might be developed for experiments involving such abuses. For the intermediate set of cases between the first and second, Bok provides only the suggestion that careful discussion is necessary before social policy is set.

While this discussion is somewhat helpful, it still leaves the dilemma of the agricultural scientist unresolved. If we follow Bok's

suggestions that populations at risk must be protected in some way, how shall we deal with populations which are at risk not through an immediate and direct intervention but through a series of intermediary processes which nevertheless have consequences for those populations?

Unlike the case of bio-medical research where a physician may take action affecting a specific individual, the continual generation of science and technology, as Padfield has pointed out, has effects not on specific individuals but on categories and classes of persons. Yet these effects, no less demonstrable although in a statistical rather than a direct-personal way, are *no less devastating.* The persons involved often express their detestation of the process; a small farmer obviously finds little joy in having his mortgage foreclosed and his farm auctioned away. Yet, because the causal elements of this process are hidden and therefore somewhat diffused, the tendency is, all too frequently, to react as Bok indicates:

> There is absolutely no reason why acknowledging that research has moral dimensions should lead to the familiar lapse into vague discourse about "values," followed by the conclusion that since such talk leads nowhere, the moral dimensions of research must, regrettably, be set aside (p. 120).

Equally, the argument being made here is that agricultural scientists can no longer take refuge in the view that their research has either had no consequences, or that the consequences are caused by others, or that the consequences are part of a causal chain of enormous complexity that relieves them of individual and collective responsibility for their outcomes.

The issue has special salience with respect to the question of the levels of technology addressed through agricultural research. Because science is itself a technologically-based process, there tends to be a structural bias that produces outcomes geared to increasingly higher levels of technological development. The scientific enterprise, until called to task, usually by outsiders and usually because environmental, ecological, or other disasters are in train, has structural biases that gear it toward continual increases in the complexity of technology.

These tendencies are encouraged by a largely unrecognized and unacknowledged bias toward capital substitution for labor. Labor, as viewed by many scientists (and not simply the agricultural segment), is

considered to be that element of production which is most randomized, uncontrolled, unpredictable and expensive.[6] As in all systematized production, the primordial assumption is to seek means to reduce uncertainties. Some uncertainties such as weather cannot be eliminated; better "control" can be developed through a capacity to predict. Other factors can be controlled, for example the nitrogen level in a given acreage. But the human factor continues to be a major uncertainty.

The level of presumption that is therefore built into the scientific process, in the form of concern about the human factor, is significant, albeit unacknowledged. Yet these assumptions take the form of the development of science and its applications that have produced the social outcomes that were delineated in the earlier part of this study. Those outcomes are not arguable; what is debatable is *"Who is responsible?"* Our contention is that, while the social outcomes are systemic, various organizations, groups, and strata must bear their share of the responsibilities for the outcomes. These include the agricultural scientists and agencies such as the Legislature. Our focus on agricultural scientists is not intended to select them as being *the* responsible group or the *only* responsible group but to begin to fix some responsibility on a clearly delineated segment of the knowledge production system.

The strategy to be suggested below is intended to create the climate not only within which change will occur but also one in which scientists will begin to confront the social consequences of their work directly.

A Strategy to Change Agricultural Research Priorities

Given the institutionalized patterns of an entity such as the Agricultural Division of the University of California and the professional socialization of most of its participants, producing change in research orientations is not expected to be simple. Yet institutions are capable of being changed and the University can also be expected to be adaptive to new exigencies *especially if its reward structure is consciously linked to a*

[6]See, for example, Perkins' (1978) discussion of the search for the sterile-male technique in screwworm fly control by E. F. Knipling.

change strategy. Accordingly, we will first explain the proposed change strategy and proceed to a more detailed explanation of the way in which the change procedure can be implemented.

The essential strategy for change is based on the concepts that:

(1) it is legitimate for the representative body of the people, as embodied in the Legislature, to delineate desirable social goals for the society;

(2) the degree to which these goals are either enhanced or thwarted by research can be tied to the reward structure of social entities in the public domain which produce knowledge, such as the University of California;

(3) it is reasonable to expect that the capacity to undertake research to fulfill the social goals will require time;

(4) with the passage of time, if the knowledge necessary to produce social goals is not developed within the University of California, other agencies can be found that may be more successful in satisfying the goals through research.

To accomplish these orientations, a procedure is suggested in which the Legislature adopts certain social goals, gives the University as a public agency time to implement research that supports them, and then adjusts the publicly-funded research budget according to the degree to which the University's research strives to satisfy the goals. Key to the entire process is the concept of *prioritization* in which the Legislature makes clear its preferences with respect to social goals as they represent desirable social outcomes for the University's agricultural research.

Prioritization of Social Goals and Research Objectives

The precedent for the approach taken here should perhaps be emphasized at the outset; nothing new is suggested other than a different mechanism to implement policy.

Ever since the development of the land-grant complex that began with the Morrill Act of 1862, it has been national policy for government to seek to realize social goals through legislative intents. The

elaboration of the land-grant system and the complex of legislation and institutions created as a result have all been intended to develop national purposes with respect to the agricultural and rural sectors of American society.

That the land-grant complex is aware of a number of goals is indicated by the articulation of goals, at different times by key figures of the complex. For example, goals have been expressed such as "making two blades grow where one grew before" or on the need to provide "cheap food for the urban population" or to help the export position of the United States. Similarly, goals have been articulated such as Earl Butz' celebrated "get big or get out." Other goals have also been articulated, often from within the complex, e.g., "to push forward the frontiers of knowledge." The notion of social goals, therefore, is not foreign to the land-grant complex; what is new is the idea that different social goals are now appropriate to the present condition of the United States and California.

In California the expression of such social goals has been long-accepted. Earlier we cited the example of the State Legislature making a budgetary allocation to encourage agricultural mechanization in 1964 when the bracero program ended; and in 1977 the Legislature supported research in appropriate technology, when it appeared reasonable that high technology solutions should not be the sole focus of research. The strategy proposed, therefore, follows long-established precedents nationally and in California. What is new is the suggestion of a specific mechanism to accomplish the new purposes. As has been argued earlier, despite the intents of our political forebearers, the social outcomes of their policy have produced a denudation of the rural sector, a frightening decline in the number of family farms, increased concentration in agriculture including corporatization, and staggering energy- and capital-intensivity. The strategy proposed is intended, therefore, to seek and to more consciously and deliberately *ensure* the fulfillment of socially desirable goals.

Specifying Social Goals

The initial phase of the proposed strategy involves an action by the State Legislature specifying desirable social outcomes. Without being expert in the framing of legislative language, we can suggest ways

in which these goals might be expressed:

1. The total volume of non-renewable energy consumed in all phases of agricultural production should be held to a constant within five years and a decline in all such energy consumed by 10% (or some other specified percentage) is desirable within 10 years.[7]

2. It is desirable that the decline in the number of farms be brought to a halt. The rate of decline should be reduced to X% within Y years; by 1990, the rate of decline should approximate zero. Further, by 199X, the increase in the total number of farms should be large enough to be capable of being registered through demographic analysis and be statistically significant.

3. It is socially valuable that an increasing proportion of the food consumed by Californians come from a variety of forms of self-production. These might include experiments such as the encouragement of small allotment production by urban dwellers.

4. Distribution of income within the agricultural sector should, within a period of ten years, become more equitable. Equitability involves a better distribution of income to farm workers, to workers who might transfer to self-directed production, and to small farms, e.g., there should be more of a normal probability distribution of income with a decrease in the spread between top and bottom of income earners in agriculture.

5. The total volume of chemical applications in agriculture should be reduced. It is desirable that volume be held constant within five years and that a drop in volume by 20% (or some other percentage figure) is desirable within 10 years.

6. The quality of food reaching the consumer should be held constant and improvements be registered within 10 years. Objective and subjective testing measures should be established to monitor food quality.

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[7]While we have inserted numbers here for the percentage and the number of years, our intention is *not* to have readers become focused on the specific figures. The numbers are intended to be indicative rather than definitive. In the other social goals, we will occasionally use numbers and occasionally X and Y to emphasize the suggestive character of the social goals. At the same time, our intention is that, at some stage in the future, specific numbers must be tied to each goal.

7. With economic factors being held constant for inflation, retail prices of agricultural products should be held stable or to less than a 10% increase within the next decade.

8. Based on the existing degree of concentration (the number of firms and the degree to which market shares are distributed among the firms) in a specific production system involving an agricultural commodity or commodities, it is socially desirable that no further concentration develop.

9. Although a means rather than a social goal itself, in implementing the social goals it is desirable that the University incorporate in its agricultural advisory structure a broad range of public members and constituent interests including farm workers, small farmers, organic farmers, environmentalists, ecologists, consumers, and others not presently represented. Broadened representation should bring into the consultative process constituencies and groups affected by agriculture and not simply those engaged in production.

By specifying social priorities, the Legislature notifies the various research agencies, but particularly those in the public sector such as the University of California, of the social outcomes which the Legislature holds to be desirable. At the same time, the delineation of social goals must recognize that research units of the University do not make the concrete decisions with respect to energy usage, chemical application in agriculture, etc. The research decisions made, however, within an organizational network such as the Agricultural Division of the University of California can and do have significant effects, in the long run, on social outcomes. By specifying social goals and *tying a portion of the University's research budget to research supporting these goals* we can expect a response as to which research problems become oriented toward achieving the new goals rather than to those which have become institutionalized over the past century.

Implementing the Goals

Two crucial parts of the strategy being proposed involve (a) providing the appropriate agency with sufficient time to begin to generate

research intended to fulfill the legislative goals and (b) attaching *limited but distinctive penalties* to the failure to develop the research trajectories in keeping with the goals.

The first aspect involves the Legislature in establishing a time frame within which the specified goals become operative. While the research process to monitor the goals should begin immediately upon adoption of the goals, it cannot be expected that the basic and applied research envisioned will begin to shift in less than five years. Time will be required before the research apparatus of the University can develop projects appropriate to the suggested social goals. Within a period of ten years, however, the University's agricultural research structure should have a significant segment of its work geared to the research trajectories implied by all or most of the goals. The Legislature should concretize its expectations with respect to the goals by specifying differential successes in different time periods. The working out of such specifications, while involving some complexities, can be accomplished with some reasonable research. We have not sought to specify concrete percentages for specific goals nor accounted for the fact that, with more than one goal being specified, some may prove to be stunningly successful and others failures. As examples of what is intended here, we suggest some possibilities:

> Within five years, it is expected that the University will be able to demonstrate that a significant percentage of state-funded research (X%) is dedicated to two of the specified goals. Failure to demonstrate this will reduce the University's agricultural budget by 5% (or some other specified percentage) below the average funding of the previous five years of support.
>
> Within ten years, it is expected that a larger percentage (Y%) of the University's budget is dedicated to research on six of the specified goals. Failure to demonstrate this will reduce the University's budget by 15% (or some other specified percentage).
>
> Within fifteen years, it is expected that the University can demonstrate that an important segment (Z%) of the research budget is dedicated to all of the goals that have been specified by the Legislature. Failure to demonstrate this will reduce the University's

budget to its maximum penalty of 25% (or some other specified figure).

In other words, failure to develop research strategies aimed at the goals will result in a *base-declining budget* for the University's agricultural research. In this process, funds not allocated to the University could be made available to other state agencies through a request for funding proposal (RFP) procedure in which institutions, organizations, and individuals can submit proposals consistent with the legislative goals.

The intent is to provide a distinctive incentive to the University to revise research priorities over time while giving adequate time to a relatively slow-moving organization to adjust itself to new social goals for its research activities. At the same time, the intent is to penalize failure *but to a limited degree*. There is no intention to tie the entire research budget to the social goals, but the University would be put on warning that failure will produce a reallocation of funds in such a way that new institutional research arrangements may begin to develop that will fulfill the social goals.

There are several additional ways that the Legislature might encourage the University's performance with respect to goal-related research by providing incentives for satisfactory work and not just penalties which the previous strategy emphasizes.

First, the Legislature could provide distinct budgetary support geared at research around the social goals over and above existing levels of funding with the notion that this special support would decline by some percentage within specified time periods for failures to achieve goals.

Second, the Legislature could announce to the University that success in allocating significant funds (X%) to research aiding fulfillment of the goals within Y years will increase the budget by Z%.

Third, the Legislature could allocate funds to provide discretionary budgets to those organized research units within the Agricultural Division that are especially effective in shifting research

priorities to projects that support the social goals.

Again, the intention here is to utilize the budgetary process to direct the overall thrust of research without becoming involved in the specification of research projects. In this way, the academic freedom of researchers can be protected while encouraging them as a collectivity to begin work on projects that will have social outcomes variant from those which have been produced in the past.

Social Impact Assessment as an Implementing Procedure

The strategy proposed to effect change in the social consequences of agricultural research involves a substantial monitoring effort as well as one aimed at developing the *projective* capacity of the University with respect to understanding the consequences that derive from research. If there are penalties for not supporting, and rewards for buttressing, the social goals delineated by the Legislature, the institution and the researchers who are part of it will want to have some assurance that a particular research trajectory will have outcomes contributing to the goals. It therefore will be vital that a capacity be developed facilitating the process by which outcomes can be projected with increasing accuracy.

To this end, we return to earlier suggestions (Friedland 1974) which recommended the development of social impact assessment capacity within the University of California. At the time of the earlier suggestion, embodied in a publication called *Social Sleepwalkers*, we suggested that a procedure be established requiring a social impact statement for all publicly-funded research. Such a statement would be prepared by principal investigators as part of the standard application for research support. The social impact statement would become part of the record of the research project around which a dual effort would be constructed by the University. Implicit in the procedure would be the idea that implementation of evaluative procedures will, at some stage in the future, have consequences for decision making about research priorities in the agricultural sciences.

Two kinds of activities were suggested as essential to the development of a stronger capacity to project social outcomes of research.

First, because scientific researchers have little experience with following the logic of an innovation, expert consulting should be made available to them to facilitate the preparation of the projection of the consequences of their work.[8]

Second, a separate and distinct process, conjoined to the first, can be developed through the evaluation of results at some stage *after* research has been completed. This procedure is intended to determine the accuracy of projections formulated in the social impact procedure. Post-factum evaluation can reveal the errors in assumptions and/or in the chains of reasoning used to assess the impacts of specific projects. At the same time, after-the-fact analysis will help formalize the methodology of impact assessment and improve the knowledge base of those persons providing consulting expertise for projection.

In specifying two sets of activities, projection and evaluation, we see the development of methodologies that will not only help guide researchers in fulfilling the goals provided by the Legislature but in formulating a scientific methodology that can be utilized in a wide variety of disciplines and in policy planning and formation.

As was argued in *Social Sleepwalkers,* the establishment of a requirement for the preparation of a social impact statement will create an additional but not enormous burden for researchers. The availability of consulting expertise will help considerably. The consequences of such a requirement, however, should be significant. For one thing, the need to consider social outcomes will bring to the attention of scientists and technologists what they have largely ignored: that there are social consequences from their scholarly work and that research is not simply a detached and socially-isolated process. The need to think in such terms will develop, in turn, as part of the process of professional socialization, the capacity to consider the differential impacts of

[8]In *Social Sleepwalkers* we used the term "predictive" rather than "projective." The shift in language was intended to produce greater accuracy in meaning since, in fact, a capacity to *predict* is considerably limited. For a more detailed discussion and explanation see Friedland, Barton, and Thomas (1978), pp. 2-5.

research on different groups and strata in society. The values assumptions underlying one research trajectory as contrasted to another will therefore become clearer. This heightened awareness of outcomes should make researchers more reflective about the kinds of society they would like to see develop rather than sustain them in their view that research has no relationship to societal development.

Impact Assessment: Social and Environmental

In many respects, the formulation of the social impact procedure has been conceptualized out of the experience of environmental impact analysis. Due consideration should be given, however, to the different purposes of the two kinds of analysis. In specifying the character of social impact assessment, it may prove useful to outline the differences between environmental impact assessment and social impact assessment to clarify differences and similarities.

First, an environmental impact report is created at the time an action is contemplated. Once created, it formally initiates a review process within governmental bodies intended to guide a decision as to whether to proceed with a specific course of action such as a construction project. In contrast, the intent of social impact assessment is to create the basis for long-range assessment over a period of time. The filing of a social impact statement as part of a research process should not be conceived, therefore, as impeding the implementation of a research proposal or impinging on academic freedom. Rather, the statement becomes part of a file that is stored for future analytic purposes for two reasons:

A. To assess, at some stage in the future, the degree of accuracy or inaccuracy of an assessment.

B. To specify methodologies of assessment so that, over time, the methodological sources of error can be eliminated or narrowed.

Once created, preferably with the best technical advice available, social impact statements are stored and then selected, either at random or through some principle of selection, for future evaluation as to

accuracy and methodological importance.

Second, the social impact assessment procedure should be conceptualized in a very different way than the environmental impact process in terms of the amount of energy dedicated to its development. This caveat should not be considered an "opening" to the creation of simply *pro forma* social impact statements; rather, it is a recognition of two inherent dilemmas in (a) the state of the art and (b) the nature of the people making the social impact statement.

Because the state of the art is weak, it would be incorrect to thrust upon a weak methodology any great expectations with respect to detail, assemblage of data, or development of the chains of reasoning. Rather, in the initial applications, social impact statements should be expected to be fairly simple formulations, perhaps emphasizing a line of reasoning rather than attempting to develop a solid base of qualitative or quantitative evidence. The social impact statements will be prepared almost entirely by scientists who have great experience in developing chains of reasoning with respect to their spheres of competence but who are less experienced at understanding *social* chains of reasoning. It would be expecting a great deal, therefore, for such people to develop elaborate statements of impact.

As time provides opportunities and experience, social impact procedures will become clearer and scientific personnel will become more adept at developing analyses. In addition, to the extent that technically proficient advice can be made available to some scientists in facilitating the preparation of the social impact statement, there will be a gradual diffusion of knowledge about methodology. Thus, in the initial phases of implementation, the statements can be expected to be fairly simple but begin to develop greater detail and sophistication with time and experience.

Third, an essential feature of the entire process is the need for the University to provide technically proficient personnel available to give advice in the development of statements. In this respect the procedure contemplated for social impact assessment is significantly different from the environmental impact procedure. In the environmental impact system, a large number of consulting firms have developed some expertise in the preparation of reports. These firms are often part of or spinoffs of planning and architectural firms and the preparation of the report is a for-profit activity. Since the developer is the client, the autonomy of

the firm preparing the report leaves a great deal to be desired. The result is that the quality of environmental impact reports has been low, they have generated a great deal of controversy, and they have also created considerable skepticism about the entire process.[9]

The major difference between the environmental impact and social impact assessment procedures is that the latter process will create, within the University, an autonomous organizational unit, placed in a relatively insulated set of circumstances.

The need to develop distinctive expertise and methodology can fit quite well with the historical and traditional procedures of the University. It is essential, however, that any personnel involved in the development of a methodology of assessment be insulated from the institutional pressures that can produce results with an institutional bias. For example, when the University of California found itself under attack for the impact of mechanization, it commissioned a number of studies, most of which have produced arguments that social impacts of mechanization will be relatively small (University of California, Division of Agricultural Sciences 1978). The fact that the research was conducted by personnel already within established institutional circles of agricultural research placed the work under a cloud. This sort of situation should be avoided in implementing the social impact assessment procedure and, in this respect, the lessons of environmental impact reporting should be taken very much into consideration.

Maintaining an organization *within* the agricultural units of the University will inevitably tend to create pressures for certain types of results. Since the agricultural sciences community is equivalent to a client and would be "paying" for results if social impact assessment was conducted within the Agricultural Division, it is essential that an autonomous procedure be established from its inception. This can be accomplished by creating a distinctive organism, a Predictive and Evaluative Methodology Unit, within the University but outside of the Agricultural Division.

Finally, a major difference between the social impact and environ-

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[9]Since the quality of the work is so shoddy, and since environmental impact reports almost invariably "prove" what will benefit the paying client, people have a great deal of skepticism about them, and this also transfers to any ostensible procedure or methodology through which they have been created.

mental impact procedures must be institutionalized in the form of post-factum evaluation. At present the environmental procedure simply emphasizes the assessment of impacts and no procedures have been proposed to assess the validity of an environmental impact report. Not only does this not lead to the development of any scientific validity, but, more importantly, it leaves the process of knowledge accumulation to some mysterious experiential process.

In contrast, what is proposed through the social impact assessment procedure is a distinctive function, *evaluation,* which will be conducted on a regular and systematic basis. By delineating a specific research activity and locating this function within a distinctive and autonomous unit, the basis for a cumulative process in knowledge-development becomes feasible. In this respect, then, social impact assessment is significantly different from the environmental impact procedure.

In sum then, four major differences are projected between social and environmental impact procedures: 1) the social impact statement creates no basis for immediate action but is stored for later evaluation although there is a clear understanding that, at some stage when the methodology of social impact assessment improves, the statements will become the basis for decision making with respect to research priorities; 2) social impact statements are limited in scope and can be expected to be very simple initially and develop sophistication and complexity only with experience; 3) the University must make technical advice available to scientists to facilitate the development of experience in preparing social impact statements and this function must be autonomous; and, 4) post-factum evaluation as a systematic and institutionalized procedure, autonomously conducted, is essential.

The Dangers and Problems of Change Strategies

Any strategy of change implies a conscious and deliberate "tampering" with the social system. Though the proposed strategies are new, they are not exceptional and in this section we will examine a number of questions that can *and should* be raised about change

orientations. Some of these dilemmas are related to normative concerns within the university, e.g., academic freedom. Others are concerned with the efficacy of the proposed strategies, for example, whether they can be co-opted by the existing institutional structure or deflected from their intent.

Two additional problem areas will also have to be confronted. On the one hand, experience with social change policies and their implementation shows that when new agencies are created to promote change, the possibility exists that such innovations, as they seek to become legitimated and carry on their assigned functions, can be *co-opted* or absorbed by an existing network of institutions and relationships. The problem of co-optation must therefore be confronted. A conjoined but separate issue is focused on the question of goal deflection. As change is undertaken, experience shows that the original goal intentions may be changed as agencies come to grips with existing social realities, particularly as the human and political base on which they have been built changes.

A special problem exists because the two basic institutions on which the proposed strategy is developed include the University, well-known for its stability, the tendency to ignore the need to change, and the Legislature, peculiar because of its stability over time while answering to the immediate exigencies of political issues. In particular, the special characteristics of the Legislature will have to be examined since this body is projected as the key instrumentality for effecting the proposed changes.

In setting out some of the problems that will have to be faced in undertaking a change orientation, we would argue that a sober and realistic assessment of the dilemmas must be confronted. This is not to contend that change is impossible; indeed, we are convinced that it can be accomplished. At the same time we consider it useful to note the difficulties that always exist when planned social intervention is undertaken.

The Issue of Academic Freedom

The immediate response from many individuals, including University administrators, to suggestions that research orientations might be prioritized and redirected to support new social goals has been

to raise the issue of academic freedom. When it is contended that change in research orientations would benefit society as well as the University, the counter-argument is given that any such "redirection" of research would constitute a violation of the academic freedom of University faculty. Accordingly, it is contended, the present organization of research should remain intact lest any interference begin the dangerous erosion of academic freedom.

This argument is not without its worrisome aspects. Undoubtedly, the capacity of the university, as a generic institution in American society, to retain a considerable degree of autonomy has served it, and society, well. In addition, from the point of view of those who are part of the university, the ability to develop their social criticism without having their work impeded by administrators, legislatures, or trustees, has provided significant protection to such critics.[10]

Clarity should be maintained between the differences in academic freedom, which deals with the right of faculty members to present material within the classroom in the manner they believe to be appropriate and to have clear rights to delineate their own research agendas *and* the availability of funds, through many different mechanisms, that can "pull" research in distinctive directions. Thus, clear recognition must be given to the fact that the interests of the nation or the state have influenced the development of academic research. While the work of a considerable number of scholars may remain "untainted" by direction from external sources, a variety of structural factors have been developed over the past century to shape research decisions.

It is important to note that the entire enterprise of agricultural research has been shaped by the clear and conscious orientations of policy-makers, on the one hand, and researchers and administrators within the agricultural segments of the university, on the other. The need for agricultural research to be "useful" to society by dealing with concrete and practical problems encountered by farmers has long been recognized as a legitimate reason for intervention in decision-making

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[10]This is not to contend, of course, that the university as an institution has been wholly perfect in protecting the rights of critics in the name of academic freedom. Even in normal times at some universities, critics find their work impugned "on scholarly grounds." In more difficult times, such as during the McCarthy period, the norms of academic freedom failed to protect a considerable number of critics.

about research.[11] To the extent that researchers, as a collectivity within a publicly-supported institution, feel constrained to justify their existence, this has surely had influences on the research process and therefore on academic freedom.

More significantly, the direct intervention of government, usually the federal, has influenced the research process by specifying priorities in certain problem areas. The decision to develop the atom bomb in the second world war represents an obvious example. Intervention in the research process was sufficiently important that the research organization was located within several universities. Thus, the first atomic reaction took place in a university setting and, even today, major research in nuclear applications continues at two separate laboratories administered by the University of California, at Los Alamos and Livermore.

But intervention in the research process also occurs in other ways. In recent decades, for example, it has become clear that public and private foundations do not simply support any piece of research, no matter how useful or important it might be. The larger foundations shape research decisions by delineating specific program areas within which research will be supported. The present study, for example, is the product of the State of California acknowledging the importance of encouraging research in Appropriate Technology. Because funding becomes available in a specified program area, individual researchers respond to the carrot of research dollars. Thus, while Professor X might be interested in researching another topic, the availability of funds constitutes a constraint on that person's research decisions. This is not an unnatural situation, of course, but it is useful to be reminded that academic freedom is constantly in "jeopardy" in the sense that very few scholars, if they want support, are able to follow the directions they choose irrespective of external constraints.

The approach that has been suggested here should be no more "threatening" to academic freedom than any processes which have

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[11]See, for example, Rosenberg 1976, Chapters 8-11. Busch and Lacy also report that "there is some evidence that southeastern experiment stations are more likely to engage in 'brush fire' research demanded by commodity groups than are stations in other parts of the country" (p. 12). Even in California, however, they note that one younger scientist "reports that his research ... had been suggested by his chairman following contact" with a group of growers in the state (p. 12).

been institutionalized and are currently acceptable in university practice. While a strategy of change involving the Legislature and the University in interaction is proposed, the specific forms suggested constitute no more a danger to academic freedom than currently exists. Thus, there is no intention to suggest legislative intervention that specifies research projects or that directs research except in terms of long-range social goals. Since the direction of research towards social goals has become traditional, no potential threat to academic freedom exists other than that which is already normative in society.

One potential "threat" to research that might be regarded as "anti-university" is that the development of strategies aimed at producing change in agricultural research should not be given over to a monopoly by the university. At present, the university has an essential monopoly of research dollars specified for work in the agricultural sector. Our proposal specifies that, under specific and limited conditions, an alternative possibility should be conceived by the Legislature in which research funds could be made available to external entities which fulfill the projected goals better should the university fail to do so. It is our contention that if the university is unable to adapt to clearly-delineated social goals, in broad and general terms, than other agencies should be given the opportunity to serve the needs of society.

The Dangers of Co-optation: Unanticipated Consequences

Every planned intervention runs the danger of failing to accomplish purposes set out and specified by its creators. Co-optation refers to the process by which a mandate is incorporated within an organizational structure and reformulated to sustain that structure, countering the original intents of the mandate.

Human institutions and their embodiment in formal organizations are not always effective instrumentalities despite the attribution to them of rationality and deliberation. The sociological literature is replete with examples of social interventions intended for one purpose ending up serving almost totally discrepant ones. Here we have no intention of developing the argument in detail other than to cite two relevant cases as exemplary of the dangers that must be confronted in planned

interventions. Our choice of examples are deliberately selected from amongst those involving agricultural constituencies although a much broader range of examples could have been included.

The TVA case. While the Tennessee Valley Authority was long held up, during the post-war period, as an example of democracy at the grass-roots, in recent years, as the TVA has become a major producer of electrical power, it has found itself in difficulties with enviromentalists, Appalachian people, and others. TVA's deflection from the grass-roots intentions of its founders has been amply documented by Selznick (1953). Beginning with Merton's (1936) conception of "unanticipated consequences," Selznick demonstrates the way in which a relatively broad mandate to develop grass-roots became implemented by the Authority. Looking for some way to relate to the local communities within the area of its jurisdiction, the Authority quickly integrated itself with land-grant colleges and institutions.

Selznick's discussion demonstrates the consequences that flowed from the decision to develop this particular grass-roots constituency rather than seeking to create a new one; the TVA became linked to existing centers of economic power and provided additional resources to these centers rather than to other less-organized constituencies with greater economic needs. The process was not without its internal conflicts within the Authority and its staff; the end product, however, confounded the intention of the Roosevelt administration by consolidating economic power rather than developing a more equitable distribution of economic resources.

Because Selznick saw the intents of the creators of TVA as confounded, he used the paradigm of unanticipated consequences to explain the outcomes. While, at one level, this sort of explanation is satisfactory, at another it is wanting. In historical retrospect (which is easier for us than it was perhaps to the founders and implementers of TVA — and to Selznick), it is perhaps simpler to note that when an entity is created to fulfill a mission, unless its mandate is specified concretely, there will be a tendency to "fit" the new organization to existing centers of power. This conclusion will be further amplified when we discuss the problem of deflection below.

Agricultural Extension and the Farm Bureau. This case has been drawn from fairly extensive analyses but more particularly from that of McConnell (1969) and Fiske (1977). Both deal with the formation of

the Farm Bureau as a creation of agricultural extension resulting from the adoption of the Smith-Lever Act in 1914. McConnell examines the process nationally while Fiske concentrates on California. Both note that the Farm Bureau was formed when the newly-established agricultural extension service required an organizational means to reach a socially and geographically dispersed potential constituency. Unwilling to utilize existing organizations such as the Grange, the extension agents built a new organizational network, the Farm Bureau. Fiske shows the specific means by which this effort quickly became linked to existing, localized centers of economic power. Within a short period of time, the Farm Bureau emerged as the instrumentality of the more economically powerful farmers. While extension was originally conceived of as a means of strengthening the rural sector, given the scarce resources available, the need to demonstrate results through increased production, the imminent pressures for food production of the first world war, and the antipathy that extension (and USDA) had toward that segment of the agricultural community involved in protest and social movement activities, extension became linked to existing power groups. Thus, a process intended to develop the rural sector had the unanticipated consequences of accelerating the process of concentration within agriculture.

These cases illustrate one dilemma that must be confronted in suggesting a process of change linked to established interests: the dangers of co-optation. As we set out the specific strategies, we acknowledge this dilemma as a serious problem. At the same time, analysis of prior cases suggests the need to anticipate the unanticipatable. The co-optive character of large-scale organizations such as the University and the Legislature should not be underestimated and plans should be developed which incorporate these tendencies.

The Problem of Goal Deflection

Goal deflection involves the reshaping of goals from an original intent to accomodate some existing organization or set of social arrangements.

One way of illustrating the problem of deflection can be demonstrated by considering the case of the War on Poverty (Moynihan 1969; Sundquist 1969). Lurching into an action program in the aftermath of

the Kennedy assassination, the poverty program initially by-passed existing linkages in the political system by making federal funds available to local groups involved in antipoverty actions. The immediate repercussions of this organizational structure were that local groups concerned with changing the distribution of income in the community found resources to carry on their work that were immune from the institutionalized political system. It should come as no surprise, then, that the mayors of major urban communities rapidly organized to change the way in which the war on poverty had been set up.

The reaction of the mayors became concretized in the "Green Amendment" that was incorporated into the budget of the second year of the war on poverty. Through the Green Amendment, the anomoly of direct funding of local groups by the Office of Economic Opportunity was brought under control by requiring the creation of community action agencies as formal recipients of funds and by requiring local political jurisdictions to form the community action agencies. The Green Amendment created a significant deflection from the original program intentions. Although the original goals of the war on poverty included the elimination of poverty, the goals now became deflected to incorporate guerilla struggles *within* local political jurisdictions. Even if the Nixon administration had not followed that of Lyndon Johnson and eroded the financial base of the war on poverty even further, energies had already shifted from external action to involve low-income groups in internecine battle within local level bureaucracies. So died the war on poverty.

Structural Problems of a Legislative Strategy

A major problem in developing a strategy for implementing a program of change in the State Legislature arises from the Legislature itself, the character of its members and staff, and the processes by which it operates.

By the very nature of their roles, members of the State Legislature can rarely be experts on a particular topic although many of them develop expertise in a considerable number of general areas. Because of

the range of problems they must confront in voting on a staggering number of pieces of legislation and issues, legislators can rarely dedicate themselves to single issues or foci. While Legislative staff members can focus more closely on issues and specialize better, the same sorts of structural difficulties also exist for them. Another factor that affects the degree to which legislators can maintain concentration is related to the electoral process: legislators must run for re-election from time to time and, in the process, occasionally find themselves "diselected."

These features establish limits on what can be accomplished through a legislative process if change is sought. For many legislators, any specific issue, no matter how important it may be to them individually, must be weighed in terms of constituencies: How important is an issue to which group? What opposition will be engendered? How much energy of self and staff can be invested in a cause which may not be successful, no matter how important or valid the legislation may be?

This creates a situation in which the difficulties of working for social change in an area such as *research priorities* becomes seriously problematic. Urban legislators, having diffuse consumer constituencies, have relatively little at stake, in the direct sense, in making significant commitments to developing this sort of political program. For them, changing the agricultural research priorities within the University of California, for example, has little political appeal. At the same time, because large-scale agricultural interests are well-organized and integrated with the University's agricultural organization, the possibilities of mobilizing pressures against such legislation are considerable.

In developing a strategy of change based on the Legislature, all of these factors must be taken into consideration and they underline the hazardous character of the projected enterprise. At the same time, any reasonable strategy geared at change must assess the various "entry points" through which change can be effected. And in this respect, the other areas within which change be initiated are severely limited. An "insider's" strategy is projected by liberal elements within the Division of Agriculture. In such an approach, insiders seek to shift the resource allocation process by working within the Division, arguing with established interests, engaging in their own forms of logrolling. But this process also is fraught with difficulties since the institutionalized interests within the Division are well-entrenched and producing change

is obtained only in miniscule increments.

The process of institutional change is complex and the strategy of seeking change through legislative action is not seen as a single strategy but one of several approaches that, if successful, can perhaps produce long-range and effective change.

Conclusion

The particular strategies we have developed for producing change in the research process of the University have been formulated in ways that not only protect the integrity of the University as an institution and the academic freedom of the individual scholar, but also in ways that are traditionally legitimated and that can work towards accomplishing distinctive social goals.

In this proposal, we have not sought to spell out every element of the process necessary to implement it. Rather, we believe it to be essential that debate be engendered over various elements of the proposal, while sufficient detail has been provided in our argument so that its general thrust can be understood. Implementation requires, in any case, a legislative procedure that would be, as such procedures normally are, widely consultative. What is important is that a discussion begin on the development of a change strategy. As we argued in the introduction, the increased dissatisfaction with the social outcomes of research demonstrate that some new means must be effected to produce *different* social outcomes than those to which we have become accustomed. The present proposal constitutes, we hope, a contribution to the development of a strategy of change.

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